**NOTES**

**Effective nuclear charge**: the strength of the attraction between protons and electrons in an atom

* Increases across a period
* Stays the same down a group because the increase in nuclear charge is canceled out by the increase in shielding electrons

**Shielding electrons**: electrons in the energy levels between the nucleus and valence electrons.

* Called shielding because they shield valence electrons from the force of attraction exerted by the positive charge in the nucleus.

**Connection to Periodic Trends:**

* Electronegativity and ionization energy decrease down a group because there are more shielding electrons, so the nucleus has a weaker hold on the valence electrons
  + Electronegativity: electron shielding makes it harder to attract more electrons
  + Ionization energy: electron shielding makes it easier to remove an electron from an atom

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**Effective Nuclear Charge & Shielding Electrons Practice Problems**

1. Complete the table below using your knowledge of effective nuclear charge and shielding electrons. Use the hints in the first row to help you with your calculations.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element | Nuclear Charge (atomic number) | Total electrons (atomic number) | Valence electrons | Shielding electrons *(total – valence)* | Charge “felt” by valence electrons *(nuclear charge – shielding electrons)* |
| Fluorine |  |  |  |  |  |
| Beryllium |  |  |  |  |  |
| Silicon |  |  |  |  |  |
| Oxygen |  |  |  |  |  |
| Gallium |  |  |  |  |  |

1. Circle the element that has more shielding:
2. B or In
3. Cl or I
4. Mg or S
5. Ar or Xe
6. Tl or Y
7. Ca or Ga
8. What charge do the electrons feel in the first level of a neon atom?
9. Nuclear charge: \_\_\_\_\_\_\_\_
10. Are there any shielding electrons between the nucleus and the first energy level? \_\_\_\_\_\_\_\_
11. Charge felt by the first level electrons: \_\_\_\_\_\_\_\_
12. What charge do the valence electrons of a neon atom feel?
13. What charge do the electrons feel in the first level of a sodium atom?
14. What charge do the electrons feel in the second level of a sodium atom?
15. What charge do the valence electrons of a sodium atom feel?
16. Which will experience the greater effective nuclear charge, the electrons in Argon’s 3rd energy level or Krypton’s 3rd energy level?

**CHALLENGE ROUND:**

Which best starts each statement?

**A.** The item in column A **B.** The item in column B

**C.** The item in column C **D.** Neither item A nor B

\_\_\_\_ 1. N O is larger

\_\_\_\_ 2. P Al has three valence electrons

\_\_\_\_ 8. S F is smaller

\_\_\_\_ 9. Rb Ca has a greater electronegativity

\_\_\_\_ 10. Al C has a greater ionization energy

\_\_\_\_ 13. Mg S forms an ion with a charge of +2

\_\_\_\_ 17. Si Se has more valence electrons

\_\_\_\_ 18. Ba Mg is larger because it has more energy levels

\_\_\_\_ 19. Ag Cu is in the same period as I

\_\_\_\_ 20. P F is in the same family as Cl

\_\_\_\_ 21. across down nuclear charge is cancelled by the shielding effect

\_\_\_\_ 27. K I has a higher ionization energy

\_\_\_\_ 28 Atomic radius Electronegativity increases down a group from top to bottom

\_\_\_\_ 29. F Br has a lower electronegativity

\_\_\_\_ 30. Al Cl is smaller